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The INSTITUTE Spokesman

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Official Publication of NATIONAL LUBRICATING GREASE INSTITUTE

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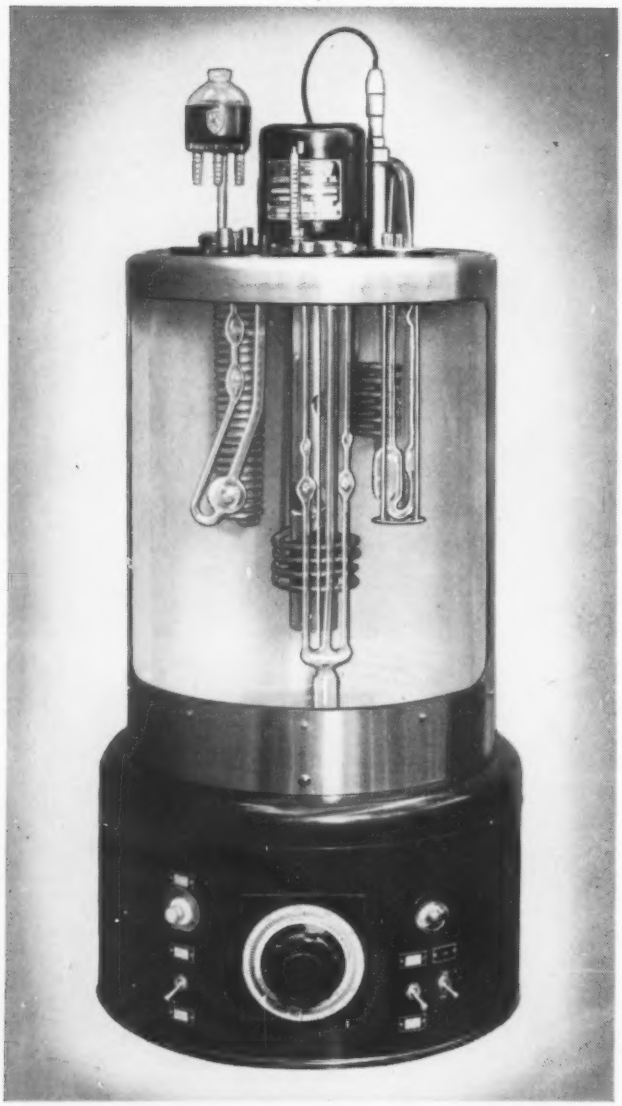

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Correction

We regret that an error was made in the September issue of the SPOKESMAN in conjunction with the article on polyether synthetic lubricants. The photograph appearing on page 25 was inadvertently reversed so that the bearing lubricated with mineral oil was shown on the left and that lubricated with the synthetic fluid was shown on the right, instead of as described in the heading under the photograph.

Ben Symon Elected President of N.L.G.I.

Shell Oil Executive Will Be 1949 Institute Head

Ben G. Symon, manager of the lubricants department, Shell Oil Company, New York, was elected president of the National Lubricating Grease Institute at its annual meeting at the Edgewater Beach Hotel, Chicago. The institute is the national organization of U. S. grease manufacturers. During the past year, Mr. Symon served as the group's vice-president and chairman of the program committee.

A graduate of the University of Missouri, where he majored in mechanical engineering, Mr. Symon joined Shell in 1928 as a lubricating engineer in the company's St. Louis office. He became manager of the technical products department in 1937, and on September 1, 1940, was transferred to New York to assume responsibility for all technical products sales east of the Rockies.

Mr. Symon was named manager of the company's lubricants department in 1942, and has held the position ever since.

Other officers elected at the National Lubricating Grease Institute's meeting were: vice-president, A. J. Daniel, Battenfeld Grease and Oil Corp., Kansas City, Mo.; treasurer, E. V. Moncrieff, Swan-Finch Oil Corp., New York; and executive secretary, H. F. Bennetts.

The following directors whose terms expired October 1, were re-elected for three-year terms: M. R. Bower, Standard Oil Company (Ohio); F. C. Kerns, Texas Company; W. H. Saunders, Jr., International Lubricant Corporation; and Mr. Daniel, Mr. Moncrieff and Mr. Symon.

The INSTITUTE SPOKESMAN

Published monthly by
THE NATIONAL LUBRICATING GREASE INSTITUTE

HARRY F. BENNETTS ..... *Editor*
4638 Millcreek Parkway
Kansas City 2, Mo.

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BREWER WILL BE SALES MANAGER OF NEW NOPCO DISTRICT

Appointment of Walter E. Brewer as district sales manager for its newly formed Eastern District has just been announced by T. A. Printon, Vice-President, Industrial Division, Nopco Chemical Company, Harrison, N. J.

Mr. Brewer will head up the present field force of five representatives and will be responsible for sales on the products of Metasap Chemical Company as well as those of the Industrial Division of he parent company. He is well qualified to handle his new assignment which is effective immediately. A graduate of Muhlenberg College with a B. S. degree in chemistry, Mr. Brewer has been with NOPCO over 12 years. Before acting as a sales representative in Eastern Pennsylvania, a post he has held for the past three years, he acted in the same capacity in the New England area. He is well versed in company products and their application having spent several years in the Harrison laboratories working on product control and customer service problems.

The new Eastern District comprises the Middle Atlantic States from Metropolitan New York to Virginia.

1949 N.L.G.I. Annual Meeting to Be In New Orleans, October 3-5

Early Reservations Indicate Record Attendance

From all indications the N.L.G.I. 1949 Annual Meeting will again be an attendance record-breaking affair. Hotel suites and rooms are being reserved through the Institute Office in large numbers with interest in the 1949 meeting running at a high level. Dates established for the affair have been definitely agreed upon as October 3-5, 1949.

All Reservations Must Be Made Through the N.L.G.I. Office

We have been advised that no reservations will be accepted by any of the New Orleans Hotels. All must be made through this office. Hotels available and assigned to accommodate our meeting are:

ROOSEVELT (headquarters)
JUNG
MONTELEONE
ST. CHARLES
NEW ORLEANS

Since hotel room space assigned to people attending this meeting is not large enough to accommodate the attendance now indicated, it would seem a wise move to—MAKE YOUR 1949 HOTEL RESERVATION *NOW*.

Testing Machine FOR EVALUATION OF Ball and Roller Bearing Grease

by GUS KAUFMAN, W. A. PRENDERGAST and R. F. STROHECKER
The Texas Company, Beacon, New York

I. INTRODUCTION

THIS MACHINE was first described by the senior author before the National Lubricating Grease Institute, Chicago, Illinois, October 4, 1938 (a). The purpose of this paper is to bring the information on the equipment up-to-date, including concurrently a large portion of the original information, since it is as pertinent today as it was ten years ago.

In the work on the development of improved lubricants for ball and roller bearings it was realized that means of evaluation of reasonable accuracy and simplicity which could be performed in the Laboratories would be necessary. Proof of performance as evidenced by results obtained in the field may be subject to considerable doubt due to the inability to control variables affecting lubrication and to the possibilities of wide variations in interpretation of results; though *extensive* service data is still the final proof of performance.

In the lubrication of ball and roller bearings, important criteria of performance may be considered to be the following:

1. Ease of application.
2. Stability in storage (where bearings are packed with grease.
3. Torque characteristics (running and starting torques at high and low temperatures).
4. Leakage.
5. Adherence of grease to the bearing.
6. Temperature of operation.
7. Stability.

While it was realized that it would be difficult to design one simple machine to measure all the desirable characteristics, an apparatus has been built and has been in operation for the past fifteen years which measures the more important characteristics; that is, starting and running torque, bearing temperature, leakage, etc. This machine is designed for both ball and roller bearing greases and in addition, the size of the bearing has been chosen large enough to permit a study of the changes which the grease undergoes during the evaluation.

The equipment is named "Torque-Breakdown Machine No. 1" as it primarily measures the tendency for "breakdown" of the grease and the starting and running torques of ball and roller bearings fully packed with grease. It may be used as a long-time test; however, the value of the apparatus as a quick screening test has proved so satisfactory that the apparatus is used only for this purpose by The Texas Company. The testing of grease for longer duration is carried out usually in machines specifically designed for endurance testing.

a "Machine for Evaluation of Ball and Roller Bearing Grease," abstracted in National Petroleum News, Vol. 30, No. 42, October 19, 1938, p. R-502.

Mr. Gus Kaufman

The name of Gus Kaufman has been prominent in the Texas Company since 1924 when he received his Bachelor of Science degree in Chemical Engineering with Distinction from the Rice Institute, Houston, Texas.

Mr. Kaufman, who was born on September 3, 1903, was brought to the Lone Star state as a child; and attended grade school and high school in Houston.

Assistant to the Manager of the Technical and Research Division is Mr. Kaufman's present position, and, for the most part, he has been with this division since joining the Texas Company.

His first work in petroleum research embraced distillation and fractionation, and, after plant work in this field and in grease manufacture, he was placed in charge of grease research at the Port Arthur, Texas, Laboratories and later at the Beacon, New York offices as Staff Technologist and then to his present position.

In his almost twenty-five years of experience in lubricating grease and allied products, which included all phases from the laboratory through the plant to the field, Mr. Kaufman has been the author of many patents and publications on lubricating greases, cutting oils, gear lubricants and allied subjects.

His name is found on the membership list of such organizations as Tau Beta Phi, American Chemical Society, American Institute of Chemical Engineers, as well as various technical committees of such organizations as the Coordinating Research Council, American Society for Testing Materials and the National Lubricating Grease Institute.

Mr. Kaufman's hobbies are mainly along sport lines, in particular, golf. He is a member of the Southern Dutchess Country Club, the Elks Club, and the Rice Institute Alumni Association.

He is unmarried.

The increased use of the subject machine as a short-time screening test for ball and roller bearing greases warranted the installation of automatic controls and recorders. This installation has furthered the usefulness of the apparatus.

II. DESCRIPTION OF APPARATUS

a. Manual Controls

In Figures 1, 2 and 3, photographs of the apparatus before installation of automatic controls are shown. This grease testing machine consists essentially of a motor-driven shaft (A) held in position by the pillow blocks (B) and driven by the motors (C) or (F). These motors may be of any speeds but for most of the work they have been operated at speeds of 900 RPM and 1750 RPM. Referring to Figure 2, the ball bearing (D), which is a 4" size 211, is held on the shaft by means of the hub (H) which is pressed into the inner race. The hub is provided with a key-way which slides over the key (G) on the shaft. Shaft (A) is shouldered to prevent the bearing from sliding along the shaft and the end of the shaft is drilled and tapped for a ⅜" screw. The bearing is locked to the shaft by the locking device (J) which is a ⅛" plate having a diameter the same as the inner race of the bearing. It is held against the face of the inner race by the ⅜" set screw in the end of the shaft. This plate together with the bolt and key-way on the shaft holds the bearing firmly to the shaft and thereby causes the inner race to revolve with the shaft. The housing for the bearing which has been designed to simulate clearances, etc., in practice, consists of two parts, (K1) and (K2), which screw together. That part of the housing (K1) which is on the outside, is sealed so that no leakage of grease occurs here, but the opposite half of the housing (K2) has an opening slightly larger than the diameter of the shaft and is supplied with a cup arrangement (not visible in Figure 2) to catch any grease which leaks out. By screwing the two halves of the housing (K1 and K2) together, the side pressure against the outer race holds the bearing in place in the housing. To measure the torque, the housing (K1 and K2) is fitted with a torque arm (1) (Figure 3) graduated to permit a wide range in torque measurements. By means of a system of levers (M) the force of the turning moment of the housing (K1 and K2) is registered in grams on platform scale (S). To measure the bearing temperatures a calibrated thermocouple (N) is screwed into the housing so that the junction presses against the end face of the outer race.

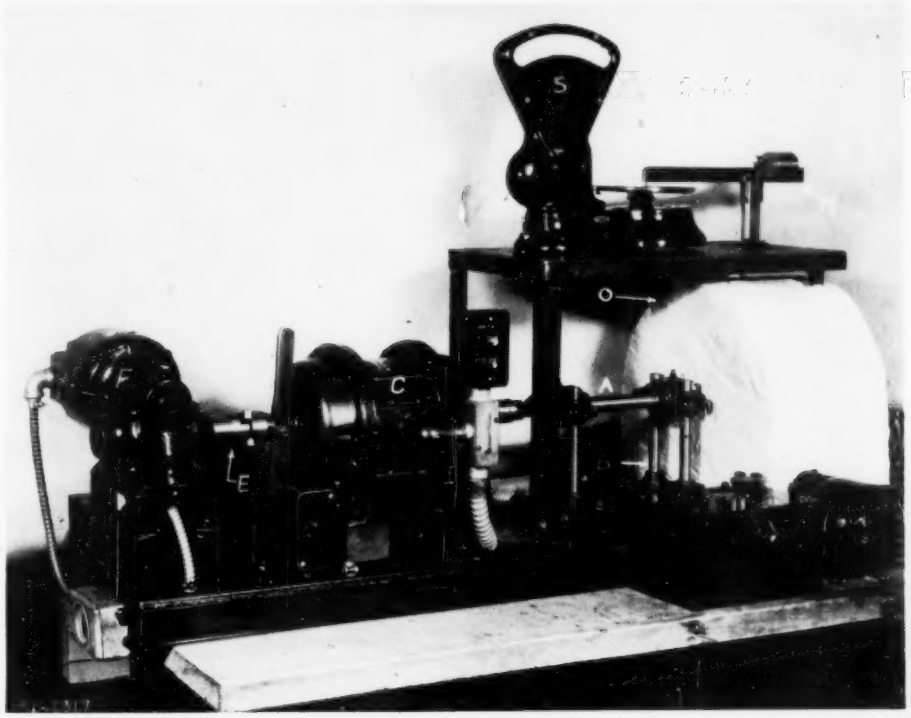

Fig. 1—Ball and Roller Bearing Testing Machine: General Set-up

To simulate high and low temperature operating conditions, the entire bearing and housing assembly has been provided with an insulated chamber (0) Figure 1, equipped with an insulated cover plate. This chamber is provided with a copper tubing coil permitting the circulation of isopropyl-alcohol cooled by dry ice. This provision yields the low temperature range from room to -40°F. The cover plate has a calrod heating unit and a fan which provides a high temperature range from room to +300°F. Thus, the overall temperature range at which greases may be tested is from —40 to above 300+°F.

The above description covers the use of a ball bearing but this apparatus is also designed for roller bearing testing. This is accomplished by use of a second housing so designed as to accommodate two opposed tapered roller bearings. Figure 4 shows the assembly for roller bearings.

b. Automatic Controls

As was mentioned in the introduction this machine has been equipped recently with automatic controls and recorders to facilitate testing.

The operation of the automatic control instruments is as follows (letters referring to Figure 5). Two units comprise the temperature control; the time-pattern transmitter (F) and the controller (E). The pattern transmitter contains a rotating cam, shaped to provide the temperatures required for control. A cam follower operating a flapper valve rides on the cam. A change in position of the cam follower causes a change in the air pressure supply to the controller (E). As the index on the controller is operated by the change in air pressure the index will assume the new position dictated by the cam follower. There is a linkage within the controller such that if the temperature as indicated by the potentiometer is less than that indicated by the index the heater will turn on. As the temperature reaches the required value the heater is turned off.

In the installation on the Torque-Breakdown Machine No. 1 the cam is cut to dictate a time pattern of a temperature rise from 80 to 250°F. in one hour and a constant temperature of 250° (+) or (—) 2.5°F. for two hours, this being one of the standard test procedures which will be discussed further.

(Continued to page 8)

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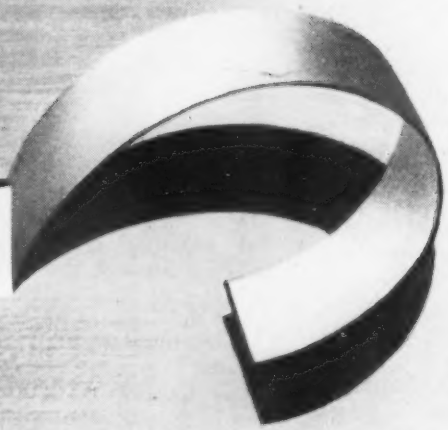

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President's Column

by B. G. Symon, President N.L.G.I.

The National Lubricating Grease Institute has made phenomenal progress since its inception. This had been due, first, to the solid groundwork laid by the founders, Mr. J. R. Battenfeld, late president of the Battenfeld Grease and Oil Corp.; Mr. W. H. Saunders, Jr., president of International Lubricant Corp. and Mr. Guy Peters, Oil-Kraft, Inc. Second: to the initiative and ability of the men who have guided the destinies of the organization since its founding. It is, therefore, with considerable diffidence that I assume the presidency, recognizing that I have my work cut out for me if I am to continue the fine job that has been done in the past.

Grease has been more or less the Cinderella of the lubricants family for many years. It has been used and abused in applications where oil could not be employed because it leaked from bearings, or where oil would run away from the dirty job it was supposed to do. Since the demand for grease constituted only 10 percent or less of the total lubricants market, many firms selling lubricants felt that it did not deserve much attention from either the sales or quality angle.

Through the efforts of farsighted and more aggressive grease manufacturers, however, this situation has gradually changed. Greases now form a major part of the lubricants business. They are no longer used just because the bearings involved happen to be located in dirty surroundings or because they have such large clearances that only grease can be maintained in them.

Accompanying the industry's altered outlook on the importance of grease have come rapid changes in grease manufacturing methods. More and more they are being reduced to an exact science. Research in grease has delved deeply into the phase relations of soap and oils, both equally important as lubricants, and into the effect of fibre structure on grease stability. New types of fat and fatty acids, many grades of mineral and synthetic lube oils, and numerous additives are being studied as components of high quality greases. Outdated specification test methods are being replaced by significant simulated performance tests. Manufacturing processes are being modernized by combining the latest knowledge of colloid chemistry with process engineering.

As a result of these new manufacturing methods, the use of better materials and evaluation test methods, our industry is now producing higher quality greases which have won recognition from the designers of new equipment. Greases are being recommended increasingly for critical applications where they have to meet extremes in speeds, loads and temperatures. It has also been recognized that research efforts expended on greases find their reward in premium prices.

On the threshold of this new era in grease technology, I am taking on an assignment of great responsibility. While modern research and manufacturing methods are gradually permitting grease to take its rightful place as an equal of oil in the field of quality lubricants, much work remains to be done before grease achieves this eminence. And it is the function of the National Lubricating Grease Institute to perform much of this work, through publication of the "Spokesman" and through the many other services it performs for our industry and all other industries concerned.

I know that I shall have the cooperation and assistance not only of the Board of Directors but of the entire organization in carrying on this work and thereby making my term of office constructive and successful. This fact has already been evidenced by the wonderful response secured from those individuals whom we approached to present papers at our last annual meeting. A cross sectional view of those in attendance at that meeting would indicate that the problem of the Institute's progress is one which is enlisting the fullest cooperation of research organizations, manufacturers and consumers.

I pledge my best efforts, as your new president, to conduct the affairs of the Institute so that it will merit this brand of cooperation, and continue to prosper and grow in importance as it has done in the past few years.

EXPORTS OF LUBRICATING GREASES
During 1947 and Eight Months of 1948*

Date	1947 Quantity (lbs.)	1947 Value ($)	1948 Quantity (lbs.)	1948 Value ($)
December	12,752,146	1,343,643	.....	.....
November	13,602,478	1,381,459	.....	.....
October	11,827,053	1,227,297	.....	.....
September	13,084,296	1,275,198	.....	.....
August	16,450,594	1,641,251	8,770,076	900,271
July	18,997,165	1,740,324	8,820,750	930,062
June	21,238,257	2,004,428	10,451,375	1,067,211
May	18,115,006	1,572,513	9,752,807	1,053,615
April	17,728,369	1,436,474	11,810,200	1,371,628
March	14,674,326	1,170,686	10,987,600	1,167,741
February	10,297,068	866,840	14,588,334	1,392,171
January	10,185,710	793,861	10,244,789	1,047,880

*From U. S. Department of Commerce, Office of International Trade.

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Testing Machine for Grease

(Continued from page 5)

The temperatures of the bearing and test chamber are recorded on the Brown Two Point Potentiometer (G).

The measurement and recording of bearing torque is accomplished by the use of Baldwin SR-4 strain gages (I) and the Baldwin SR-4 strain recorder (H). Figure 6 illustrates the apparatus for torque measurement.

The strain gages (A) (letters refer to Figure 6) are mounted on the lever arm (B). The torque from the test bearing is transmitted to the lever arm by the connecting rod (C). Under the action of high starting torques the lever arm is deflected downward until it hits the spring (D). The action of the spring is such to prevent excessive deflection of the lever arm. Under lighter running torques the spring is not used, as the arm is not deflected enough to hit the spring.

The deflection of the lever arm under the action of the transmitted torque is measured by SR-4 strain gages which consist of a fine wire which is changed in length under the action of the deflecting lever arm. The change in length of the wire alters its resistance, and this change in resistance alters the electrical circuit of the strain recorder.

(Continued to page 10)

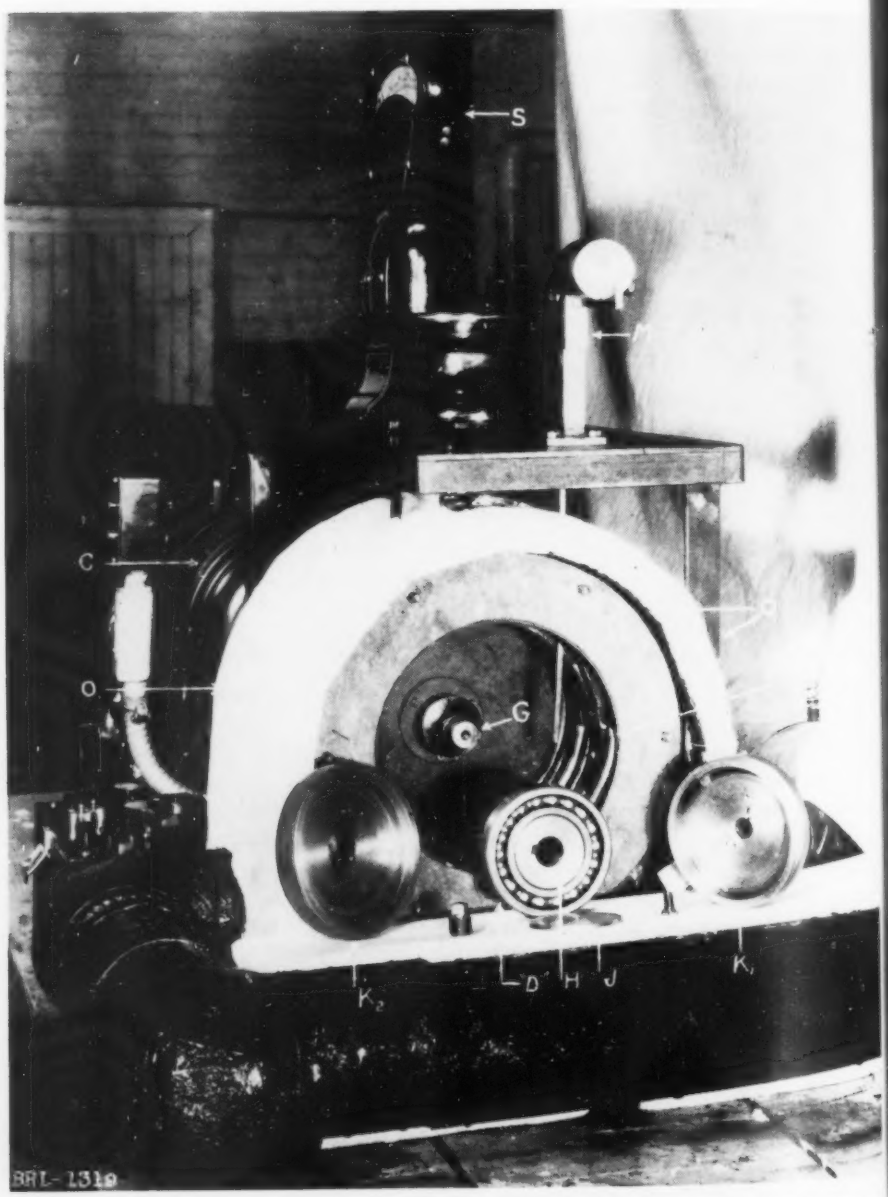

Fig. 2—Ball and Roller Bearing Testing Machine: Housing Assembly for Ball Bearing

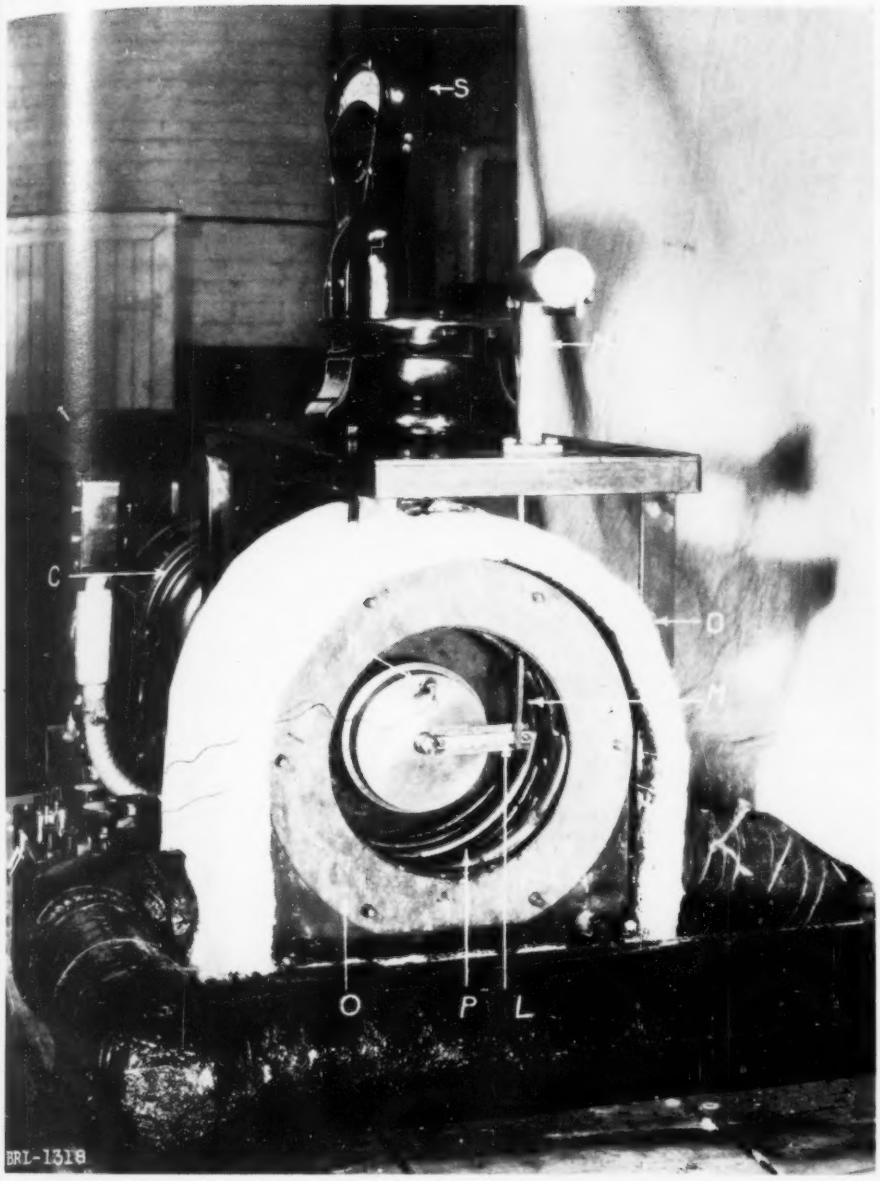

Fig. 3—Ball and Roller Bearing Testing Machine: Assembled Machine Showing Torque Arm, Thermocouple, Etc.

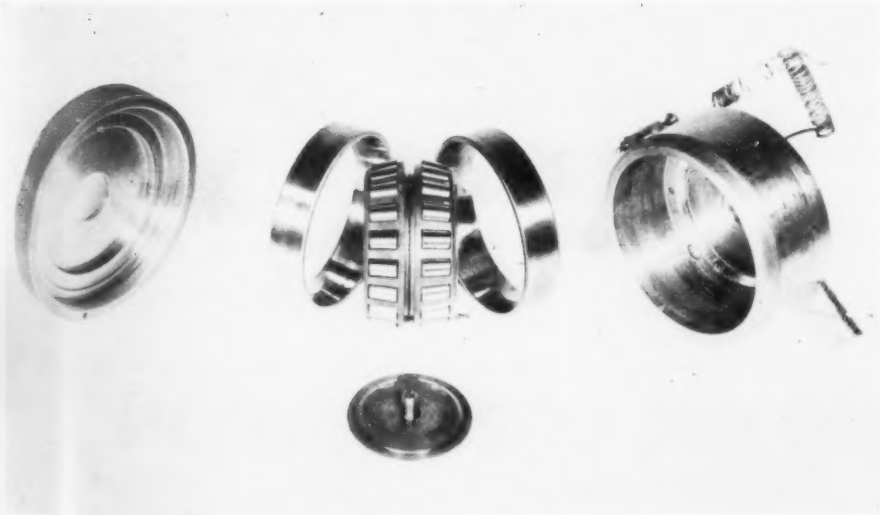

Fig. 4—Ball and Roller Bearing Testing Machine: Housing Assembly for Roller Bearing

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Testing Machine for Grease

(Continued from page 8)

producing various strain readings. As the amount of stress caused by the deflection of the lever arm is directly proportioned to the load or transmitted torque, the scale of the strain recorder may be calibrated in terms of bearing torque in grams-centimeters. To prevent excessive vibration of the lever arm, a dash pot (E) filled with a suitable hydraulic oil is mounted in front of the lever arm.

III. TEST PROCEDURES AND DATA WITH MANUAL CONTROLS

a. Test Procedure With Manual Controls

In establishing standard test procedures, it was found preferable to charge the bearings mechanically, since in hand packing there was a greater possibility of variation of the distribution of the grease on the bearing, particularly among different operators. For charging the bearing with grease a special housing provided with a suitable fitting is used. The bearing is placed in this housing and by means of a grease gun, grease is forced through the bearing until it protrudes from an opening in the opposite side of the housing.

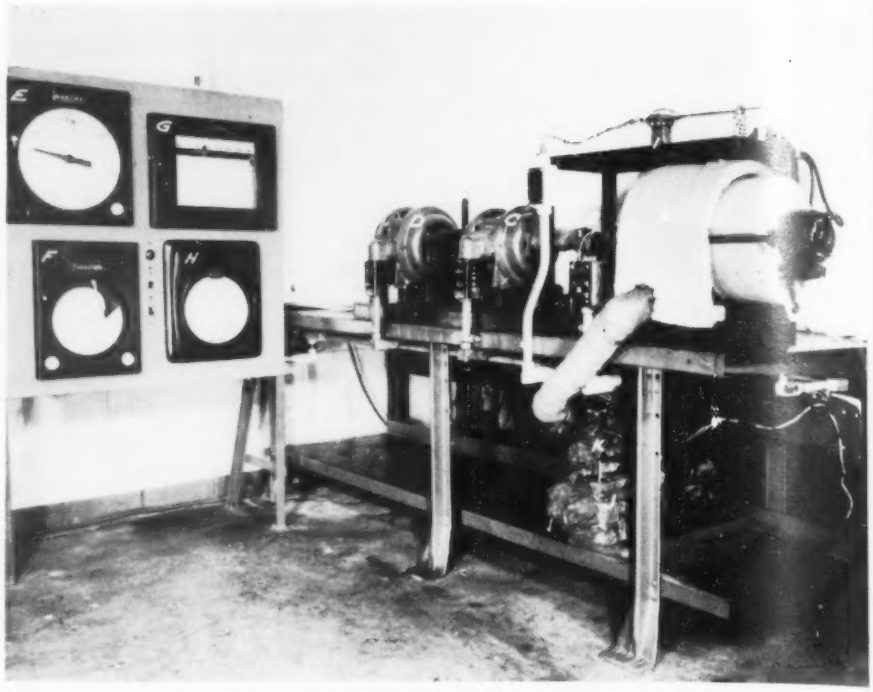

Fig. 5— Torque-Breakdown Machine No. 1 with Automatic Controls (BRL-P-13,216)

As two types of bearings are used with this apparatus two packing housings are available. For a 211 Ball Bearing it has been determined that 32.0 grams of grease completely fill the interstices between the balls.

(Continued to page 11)

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Testing Machine for Grease

(Continued from page 10)

races and cages while 50 grams completely fills the double row roller bearing. After charging with grease and removal from the charging housing the bearing is accurately weighed and any excess grease above either the 32 or 50 grams is removed.

The charged bearing is placed in the running housing and the two sections screwed together so that the housing presses against the outer race of the bearing holding it in place. The bearing is bolted to the shaft as described and linkage for torque measurement attached to the lever arm on the bearing housing.

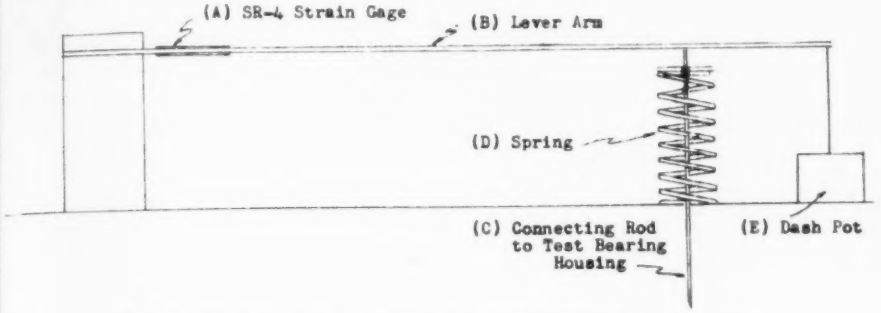

Fig. 6—Sketch of Lever Arm for Measurement of Torque

Two standard runs are made with either the ball or roller bearings. One, in which the housing temperature is held at 80°F. for two hours and the other in which this temperature is raised uniformly from 80 to 250°F. in one hour and maintained at 250°F. for an additional two hours. With manual controls, temperatures are maintained by means of a DeKhotinsky Thermo-Regulator. The starting torque is obtained by noting the deflection of the indicating arm of Scale "S" (Figure 3) as soon as the proper motor is started. Readings of torque and temperatures are made every minute for the first thirty minutes since the torque drops rapidly in the first few minutes, and for the remainder of the test, readings are taken every five minutes.

At the end of the run the bearing and housing are removed and any grease which has leaked out is determined by weighing the grease accumulated in the leakage cup. In some cases leakage is so great as not to be retained completely in the cup, in which leakage is estimated by difference. The housing is disassembled and the amount of grease determined both on the "closed" side and on the "open" side of the housing by weighing the two halves of the housing before and after the run. The bearing is removed and weighed to get the amount of grease remaining on the bearing. By means of a special miniature penetrometer[1] which permits measurements of the consistency of three to five grams of grease, the consistency of the grease remaining on the housing and on the bearing is determined. This bearing testing machine, therefore, measures the following essential characteristics: starting torque, running torque, maximum temperature, running temperature, grease on bearing, grease on housing, grease leakage and changes in the grease proper, such as consistency and any other physical or chemical properties desired.

The following tabulation presents and explains the descriptive terms of the rating system now used to indicate the general condition of grease and bearing at the end of a test.

(Continued to page 14)

[1]Miniature Penetrometer for Determining the Consistency of Lubricating Greases—Gus Kaufman, W. J. Finn and R. J. Harrington. Presented before the Petroleum Division, American Chemical Society, Milwaukee Meeting, September 5 to 9, 1938. Industrial Engineering Chemistry, February 15, 1939, p. 108.

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- **COMMITTEE REVIEWS**
- **REPORT ON PRESENT PROJECTS**
- **FUTURE PLANS**

The annual meeting of the Technical Committee, on October 13th, was well attended. The minutes are being prepared and will be sent to the members in due course. Most of the morning session was devoted to a review of the activities of the following committees:

A—ASTM Technical Committee G

Section I—Chemical Tests
Gus Kaufman—The Texas Company

Section II—Consistency and Related Physical Tests
E. W. Adams—Standard Oil Company (Indiana)

Section III—Functional Tests for Anti-Friction Bearing Greases
T. G. Roehner—Socony-Vacuum Laboratories

Section IV—Research on Thixotropic Properties
L. W. McLennan—Union Oil Co. of California

B—SAE Aeronautic Division's Aircraft Bearings and Lubricants Committee S-5c
H. C. Zweifel—Richfield Oil Corporation

C—Grease Program and Analysis Group and Global Grease Group of CLR of CRC
Gus Kaufman—The Texas Company

The talks given by the above members could be summarized to the effect that there is more work under way on the development of methods for testing lubricating greases than ever before, and the outcome of those activities will surely lead to important progress by the industry.

The present status of the projects undertaken by the ABEC-NLGI Cooperative Committee on Grease Test Methods was outlined. Attention was called to the fact that their projects, which were described in recent issues of the Technical Column, do not duplicate work in progress within ASTM Technical Committee G despite similarity of

(Continued to page 13)

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Technical Committee

(Continued from page 12)

project titles and they are potentially valuable specialized supplementary efforts.

The Panel on "Delivery Characteristics of Dispensing Equipment for Lubricating Greases" reported that the exploratory test program (outlined in the July issue of The Institute Spokesman) is almost completed and plans are being made for a meeting in the near future to decide on the next step. The report also stated that the cooperation shown by all the members, representatives of manufacturers of grease guns and lubricating greases, has been outstanding.

The morning session was closed with reference to the survey to obtain the Technical Committee's opinion of the ASTM Committee C-7, Subcommittee III, Proposed Specification for Lime used for Grease Manufacture. A questionnaire will be distributed to the members representing grease manufacturers and the information therefrom will be taken as the basis for the reply to ASTM.

The afternoon session was assigned to "new business." A series of proposals were made which involve organizing panels or subcommittees. These included a check on the present status of the NLGI classification for greases, a study of the advisability of setting up projects on manufacture engineering problems and a program to obtain a continuous supply of interesting technical data for the Spokesman. All of the proposals were accepted and they will be covered in detail in future issues of this Column as soon as they are activated.

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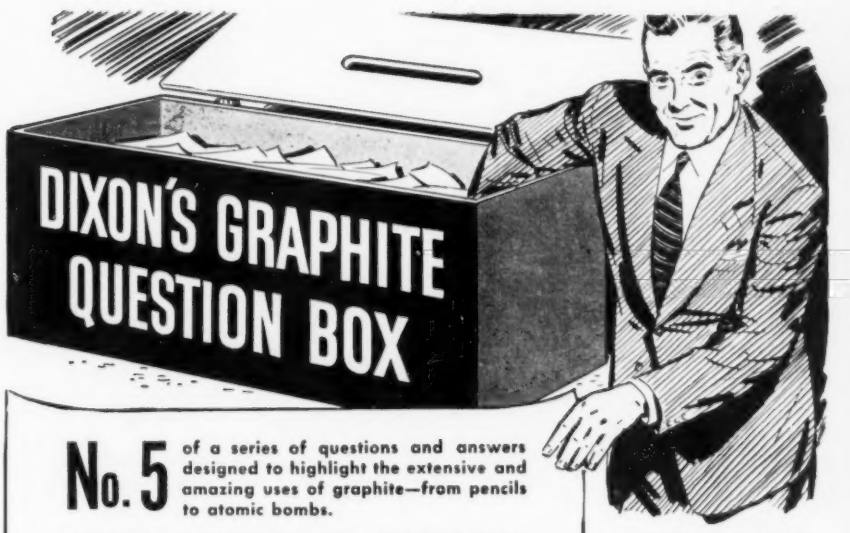

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3. It can be incorporated in powder metallurgy processes to produce oilless bearings, and in iron powder metallurgy to produce preformed steel parts of high tensile strength.

4. It withstands excessively high and low temperatures, high pressures and operating speeds, and its chemical inertness makes it insoluble in all other known substances.

5. Graphite rates high as an efficient conductor of heat, as evidenced by its long and increasing usage in producing crucibles, retorts, molds and refractories.

6. Graphite is an efficient conductor and controller of electricity, resulting in its wide usage in producing self-lubricating motor and generator brushes, dry batteries, electrodes, resistors, television cathode tubes and other products in the electrical and electronic fields. Graphite is also widely used as an electrical conductor in electroplating processes.

7. Because of its resistance to chemical and temperature decomposition, graphite is widely incorporated as a pigment in protective coatings and paints.

8. Graphite adheres readily to other substances and materials but does not permit other substances to adhere to it. That is why its services as a coating or separator on foundry sand, aluminum and other types of molds are widely recognized.

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Testing Machine for Grease

(Continued from page 11)

Heading	Descriptive Term	Explanation
Color	1. Same 2. Darker 3. Lighter	Self-Explanatory
Distribution	1. Good	Grease remains uniformly distributed around the full circumference of the bearings and remains on the cage. In the case of the roller bearing grease wipes across the face of the rollers. Lubricating film is present on races, balls, or rollers.
	2. Fair	Grease remains distributed around the full circumference of the cage, but there is localized accumulation in one portion of the circumference. In the case of the roller bearing, grease does not wipe across the face of the rollers. Lubricating film is present on races, balls, or rollers.
	3. Poor	Grease is not distributed around full circumference. Localized accumulation in one portion of the bearing.
Oil Separation	1. None or trace	Self-Explanatory
	2. Slight	Oil film remains on various parts of bearing and oil evident in crevices of used grease.
	3. Excessive	Grease has been broken down to soap and free oil. May be fairly hard granular mass in case of high soap grease, or soft "false body" faintly granular material in case of low soap grease (gets oily when worked tactually).
Condition of Grease On Bearing	1. Dry 2. Buttery 3. Oily 4. Flooded 5. Broken Down 6. Fibrous 7. Hardened	Use more than one term if necessary, or any other terms considered pertinent.
Condition of Grease Leakage While Hot	1. Dry 2. Buttery 3. Oily 4. Broken Down 5. Fibrous 6. Hardened	Use more than one term if necessary, or any other terms considered pertinent.
Condition of Bearing Following Test	To be determined after bearing has been washed in precipitation naphtha at room temperature for two minutes.	
	1. Satisfactory	This rating shall be used unless the following conditions are noted. The condition of bearing before run must be taken into account. a. Deposits (neglect normal soap or grease residues insoluble in naphtha). b. Pitting c. Stain or other discoloration d. Scoring
Overall Rating	All of the above ratings shall be taken into consideration in making this rating. Also, the percentage grease left on bearing, and the percentage leakage, shall be considered. As a guide in reporting leakage, and as a factor in the overall rating, the following classifications are offered: High — Leakage above 40% Medium — Leakage between 20% and 40% Low — Leakage below 20% In certain cases where the overall test results are unusual in any way, the overall rating of **poor, fair** or **good** shall be amplified by a description of any unusual occurrences. (i.e., aeration of grease.)	

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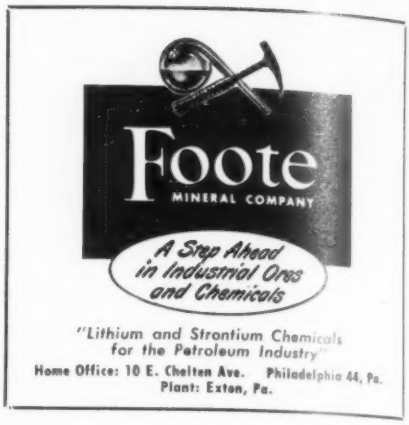
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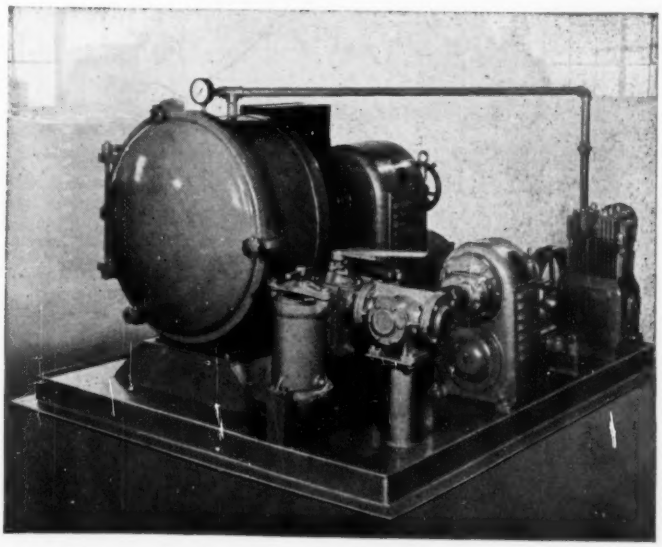

Grease Homogenizer, showing feed pumps, strainers and vacuum pump.

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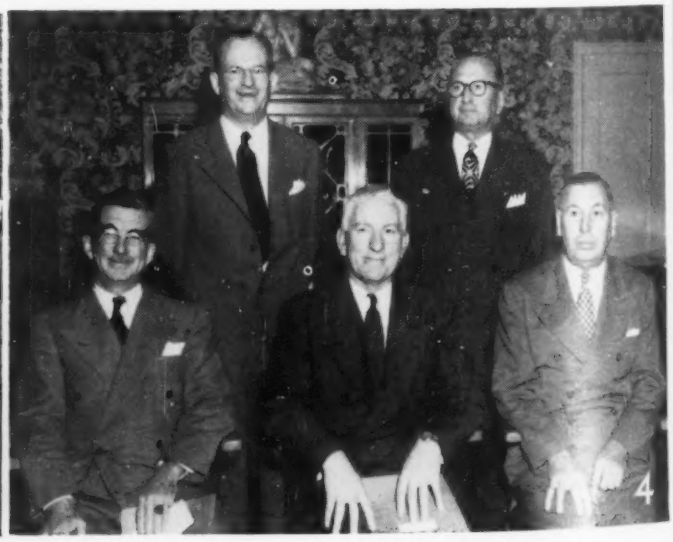
Annual Meeting of N. L. G. I. in Chicago

ATTENDANCE topping all previous N. L. G. I. Annual Meetings evidenced a keen interest in the advancements made in this industry during the past year. The most successful ever held, and certainly the largest, the entire atmosphere was charged with good feeling and the belief that still more progress was visible in the future. "Time well spent", summed up the general consensus of opinion during the three-day meeting lasting from October the 11th to 13th at the Edgewater Beach Hotel, Chicago, Illinois.

A lasting impression of bustling activity and efficiency characterized the registration desk presided over by (1) *(from left to right) Mildred Davis (Pure Oil), Laura Siefkas (N. L. G. I. Office), Maria Donahue (D. A. Stuart Oil Company) and Ann Paulson (Deep Rock).*

At the opening of the first meeting on Monday, October the 11th, 1948, retiring President, J. R. Corbett, in his speech of welcome startled the assembly by telling them the N. L. G. I. membership had soared to the highest point ever known. The official publication, "The Institute Spokesman", now possessed the largest circulation and physical size ever obtained. Mr. Corbett's welcoming message and report of progress left no question in anyone's mind that the N. L. G. I. was a tremendous success and genuine benefit to the industry it serves. With J. R. Corbett rounding out his year as President, considerable interest developed in who would lead the organization in 1949. That question was quickly answered at noon of the second day during the Board of Directors' meeting when they unanimously elected (2) *(left to right) A. J. Daniel (Battenfeld Grease and Oil Corporation) as Vice President; B. G. Symon (Shell Oil Company), President. E. V. Moncrieff (Swan-Finch Oil Company) was re-elected Treasurer.* The Board who selected their 1949 leadership are (3) *(extreme left*



around the table) H. P. Hobart, B. G. Symon, E. V. Moncrieff, A. J. Daniel, W. G. Clark, H. A. Mayor, J. R. Corbett, H. F. Bennetts (Executive Secretary), H. Coover, G. E. Merkle, M. R. Bower, W. H. Oldacre, P. V. Keyser, Jr., W. W. Albright, C. B. Karns, W. H. Saunders, Jr. Not pictured are three Directors unable to attend the meeting. These three were C. W. Georgi, F. C. Kerns and G. L. Neely.

The annual business meeting, held at the close of general session on Monday afternoon, saw the assembled membership unanimously elect six Directors to serve three-year terms. Elected to fill these vacancies are (4) *(standing from left to right) W. H. Saunders, Jr., and A. J. Daniel. Seated from left to right: E. V. Moncrieff, B. G. Symon and M. R. Bower. Not pictured is F. C. Kerns.*

Following an intensely interesting two days full of technical papers read at the sessions, the entire affair was topped off at the social hour followed with a banquet. Again a record crowd attended the social hour where they were met at the door by girls from Chek-Chart, who presented each man with a flower for his lapel. (6) *Newly elected President, B. G. Symon, received particular attention and apparently enjoyed every minute of it.* All ladies were sent gardenia corsages.

An hour later saw the start of the banquet. (5) *A most unusual note was the speakers table with the officers and their wives accompanying them. Fourth from the left is the speaker for the evening, Tom Collins, philosopher and humorist, who told the crowd about "The Price Tags of Progress'.* Although he said many things that created chuckles and gales of laughter, there was one sobering note. He said that the nations of the world and particularly governments

(Continued to page 21)

Testing Machine for Grease

(Continued from page 14)

The short time duration of this test does not warrant any rating of the lubricating qualities of the grease being tested. As has been mentioned, the test is primarily intended as a screening test which indicates the general stability and torque characteristics of the test greases.

b. Data Obtained With Manual Controls

One of the difficulties encountered in the early work with this testing machine was in the method of holding the bearing in place in the housing. Originally this was done by grinding a small flat surface on the outer race of the bearing and holding the outer race in place in the housing by means of a set screw through the housing. To circumvent the distortion caused by the set screw in contact with the outer race, the two halves of the housing are so built that when screwed together there is sufficient pressure to hold the bearing in place, this pressure being on the sides of the outer race rather than on the face thereby preventing distortion. Table I shows the effect of distortion. It will be noted that the differences in torque and temperatures are considerable and illustrate clearly that if a bearing in service is distorted by forcing it too tightly on the shaft or cramping it in the housing, it will be pre-loaded causing considerable friction and consequent higher temperatures.

As regards reproducibility of results, Table II shows the degree of

(Continued to page 19)

TABLE I
DISTORTION EFFECT
(MANUAL CONTROLS)

Bearing Manufacturer	"A"
Bearing No.	211
Speed, RPM	1750
Temperature of Chamber, °F.	80
Quantity of Charge, Grams	32

	Set Screw (With Possible Distortion	Side Pressure (No Distortion)
Starting Torque, g-cm.	14,000	9,000
Running Torque, g-cm.	2,000	1,000
Maximum Temperature, °F.	166	129
Running Temperature, °F.	166	129

TABLE II
REPRODUCIBILITY — HAND PACKED
(MANUAL CONTROLS)

Bearing Manufacturer	"B"
Bearing No.	211
Speed, RPM	1750
Temperature of Chamber, °F.	80
Quantity of Charge, Grams	20

Starting Torque, g-cm.	12,000	12,000	13,000	12,000
Running Torque, g-cm.	2,000	2,000	2,000	2,000
Maximum Temperature, °F.	164	167	160	160
Running Temperature, °F.	164	167	160	160
Grease on Bearing, %	26	26	23	21
Grease on Housing, %	74	74	77	79
Grease Leakage, %	None	None	None	None

TABLE III
REPRODUCIBILITY — MECHANICALLY PACKED
(MANUAL CONTROLS)

Bearing Manufacturer	"B"
Bearing No.	211
Speed, RPM	1750
Temperature of Chamber, °F.	80
Quantity of Charge, Grams	32

Starting Torque, g-cm.	16,000	18,000	16,000
Running Torque, g-cm.	2,000	2,000	2,000
Maximum Temperature, °F.	179	173	173
Running Temperature, °F.	179	173	173
Grease on Bearing, %	28	30	32
Grease on Housing, %	72	70	68
Grease Leakage, %	None	None	None

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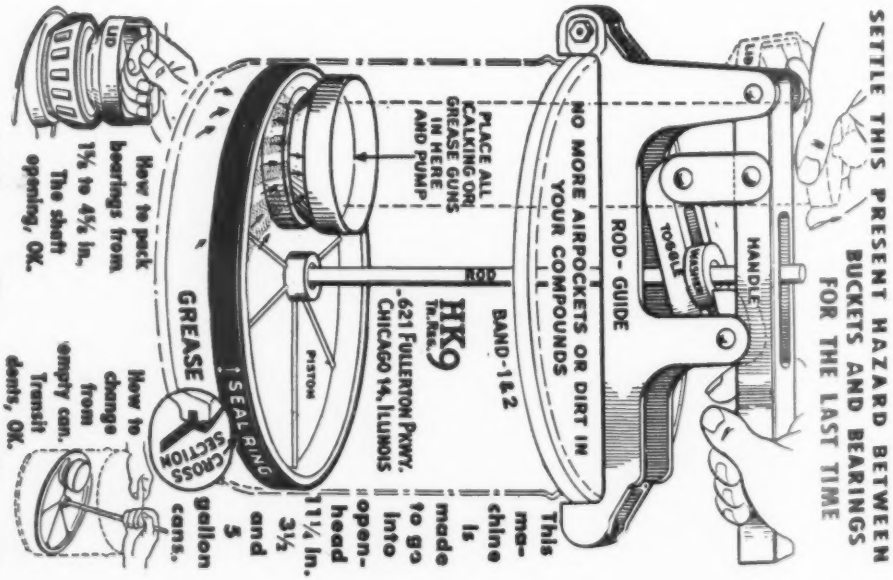
How to pack bearings from 1⅛ to 4⅝ in. The shaft opening, OK.
How to change from empty can. Transit dents, OK.
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SETTLE THIS PRESENT HAZARD BETWEEN BUCKETS AND BEARINGS FOR THE LAST TIME

(Continued from page 18)

reproducibility when the bearing is hand packed, and Table III when the bearing is mechanically packed.

In Table IV are shown the results obtained on a batch of grease mechanically packed but using a precision bearing for comparison with a stock bearing. It is noted that the precision bearing gave lower bearing temperatures, lower running torque and more grease remained on the bearing. As regards the starting torque, it will be noted that the precision bearing gave a slightly higher value than the stock bearing, but it has been found that the starting torque is very difficult to check due to the fact that it represents the initial maximum deflection of the needle on the torque scale and the results are within the experimental error.

In order to determine at what time the grease is thrown from the bearing proper into the retaining housing, an experiment was carried out in which the bearing was run at 1750 RPM for short intervals of time, the run stopped, and the grease which had been forced into the housing removed and weighed. The first reading was taken after the very short time interval of ten seconds when it was assumed that the motor had attained its rated speed. Further observations were then made at ½ minute, one minute, etc., intervals until two hours had elapsed. It was surprising to find that the entire loss of grease from the bearing, which amounted to 57.5 per cent, occurred during the first ten seconds of operation and after this grease was removed from the housing, there was no further movement of grease from the bearing to the housing. Table V points this out.

The effect of the quantity of grease charged to the bearing on the running characteristics is shown in Table VI. It is seen that there is no particular advantage in increasing the charge to the bearing since this only increases the starting torque and running temperatures and may even cause less grease to remain on the bearing. With large amounts of grease there is a tendency for the grease to be thrown from the bearing with possible leakage occurring, as is shown in this

(Tables continued page 23)
(Article continued page 25)

TABLE IV
PRECISION VS. STOCK BEARING
(MANUAL CONTROLS)

Bearing Manufacturer	"A"
Bearing No.	211
Speed, RPM	1750
Temperature of Chamber, °F.	80
Quantity of Charge, Grams	32

	Precision Bearing	Stock Bearing
Starting Torque, g-cm.	10,000	9,000
Running Torque, g-cm.	1,000	2,000
Maximum Temperature, °F.	131	146
Running Temperature, °F.	131	146
Grease on Bearing, %	49	36
Grease on Housing, %	51	64
Grease Leakage, %	None	None

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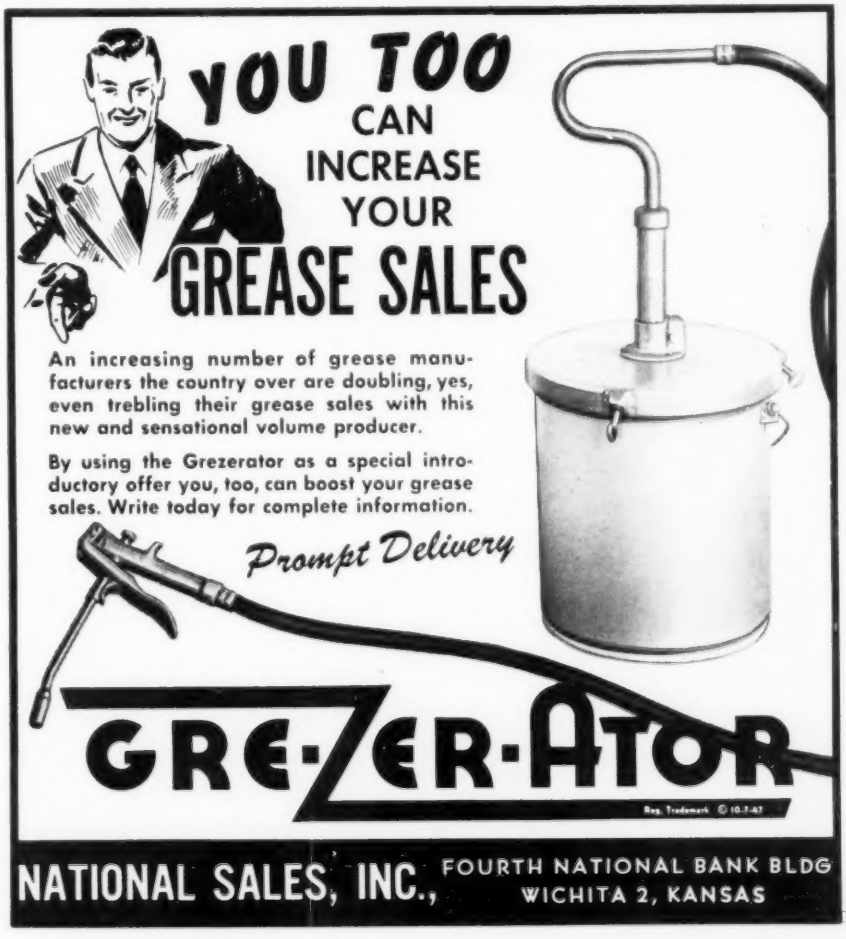
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C. E. McMichael Joins Votator Division of Girdler Corp.

John E. Slaughter, vice president of The Girdler Corporation, Louisville, Ky., has announced that C. E. McMichael, widely known food technologist, has joined the Fats & Oil Section of the firm's Votator Division. He will be associated with A. E. Bailey, who heads up that section of the Votator organization.

C. E. McMICHAEL

From 1941 until June 1948, when he resigned to become a member of the Votator staff, he was general superintendent of Durkee Famous Foods' plant in Berkley, Calif.

Mr. McMichael majored in chemistry at Miami University, Oxford, Ohio. In 1928, he began his business career with Proctor & Gamble Co., at Ivorydale, Ohio. He spent two years in inedible fat hardening, and in catalyst making and recovery. Later, he was in the copra mill, then was assigned to the chemical division. After a wide variety of specialized work, he went to the service department, where he inaugurated the training program for operators and skilled technicians. Later he was made chemical supervisor of the edible division, where his chief responsibility was quality control throughout all processes.

Annual Meeting

(Continued from page 17)

could learn much from this meeting. Such a meeting, he continued, embodied all that is good because of the spirit of cooperation so evident during the sessions. Voluntary cooperation for the single purpose of performing a greater public service, he said, was the purpose of such a gathering. If all the people in the world, and particularly their governments, would embrace the philosophy of this business group there would be no wars, depressions, pestilence and other ills and woes that beset the human race. Sitting at the speakers table (from left to right) are A. J. Daniel, Mrs. Moncrieff, Mrs. Symon, speaker Tom Collins, retiring President J. R. Corbett, B. G. Symon, Mrs. Corbett, Mrs. Daniel and E. V. Moncrieff.

(7) *Some idea can be gained about the size of the meeting sessions held in the ballroom of the Edgewater Beach Hotel on Monday and Tuesday. The crowd was too large for all to be caught in the camera's eye. Part of the assembly, therefore, cannot be seen.*

New Machinery Awaits Lubricant Development

Retiring President, J. R. Corbett, in the opening address of the session said machines in the future will have to await construction until proper lubricants have been developed to keep them in operation.

"Machines of the future, built for even greater speed than we know today will not function properly if we do not develop the proper lubricants for such machinery," he warned his listeners.

Mr. Corbett pointed to the lubricant industry as one of the most important links in American industry. But, he cautioned, "Let us not delude ourselves into believing we are the most important link. Let us recall now that if American business had not created American machines,

(Continued to page 22)

(Continued from page 21)

there would be nothing for us to lubricate."

Referring to the lubricant industry as a link in the chain of business enterprise, he then turned to the examination of the strength of that link.

Examining the link composed of the members present at the meeting, he concluded that our segment of American industry was particularly strong. Stressing N. L. G. I. accomplishments, he particularly pointed out the work of the Technical Committee headed by T. G. Roehner. The work of this committee during the past year in determining the delivery characeristics of dispensing equipment was cited as the outstanding achievement made by the Institute during the year. Further evidence of the strength of the lubricating grease industry was indicated by citing that more new members had joined the Institute in the past year than in any previous twelve month period.

Bright Future for Multi-Purpose Greases

F. W. Spooner presented a paper at the opening session which created considerable interest. It was his feeling that the future of multi-purpose greases seemed exceptionally bright.

The development of these greases has moved rather slowly due to the fact that education was needed at both the manufacture and consumption levels. However, a trend towards increased demand for multi-purpose lubricants seems to be developing along with increased efforts on the part of the lubricant industry to supply more products of this type. With the development of multi-purpose greases, confusion now existing in specifications will be reduced particularly between lubricant manufacturers and the automobile industry.

High Price for Fats in View

F. E. Lacey of Swift and Company predicted that the prices of fats for lubricating greases will be relatively high for several years. This observation was based on increase in world population, tremendous demand and uplift in the general standard of living.

In discussing various kinds of fats he pointed out that requirements for better lubricants resulted in a greater demand for those fats and fatty acids which can be depended on to do the same job from day to day because exact composition of the fat is known.

Reporting on the status of various grades of fatty constituents of lubricating grease in 1947 consumption, the speaker offered the following table:

	Million Pounds	Percent of Total
Tallow (Inedible)	37.0	26.0
Grease (Ex Wool)	26.7	18.8
Grease Oil and Lard Oil	19.9	13.9
Tallow Oil	10.8	7.6
Fatty Acids	11.3	7.9
Rapeseed Oil	8.5	5.9
Wool Grease	6.0	4.2
Stearic Acid	4.6	3.2
All Other	17.6	12.5
Total	142.4	100.0

Proper Lubricants Result in Four Point Cooperation

Howard Cooper, Sinclair Refining Company, declared that there were four distinct units of operation that must be so mingled in order to produce the proper lubricants for the particular job at hand.

The best lubrication results from mutual understanding and cooperative effort on the part of (a) designer and builder of the machine; (b) manufacturer of the lubricating accessories or systems: (c) supplier of the lubricant; (d) operator of the machine.

Should any one of these fail to understand the problem in its entirety and in detail, or to exercise the best efforts to meet the requirements, the attainment of optimum results is impaired.

Collaboration is particularly necessary where a project presents revolutionary ideas for which there may be no specific previous experience for guidance, Mr. Cooper said. Confidential aspects of designing need be no deterent in collaboration and cooperative effort. It is seldom necessary to disclose the secret details in seeking advice or details from the other partners in lubrication; nor is there a necessity for formal consultation, he concluded.

Test for Lubricants Described

H. Reynolds of the Fafnir Bearing Company described a series of tests to which lubricants are put to examine needed characteristics to meet particular requirements.

With accompanying slides he demonstrated tests for storage bleeding, separation at 212° F., dirt count, oxidation bomb test, melting point, corrosion, consistency, low temperature, low temperature torque, water resistance, soap content, viscosity, oscillation, and others.

(Continued to page 32)

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(Continued from page 19)

TABLE V

GREASE ON BEARING VS. TIME
(MANUAL CONTROLS)

Time In Seconds	Grease Removed from Housing	Leakage
10	57.5%	None
30	0%	0
60	0%	0
2 Hours	0%	0
Total	57.5%	None
Grease Remaining on Bearing	42.5%	

TABLE VI

EFFECT OF QUANTITY OF GREASE CHARGED
(MANUAL CONTROLS)

Bearing Manufacturer	"C"
Bearing No.	211
Speed, RPM	1750
Temperature of Chamber, °F.	80

Grease Charged, Grams	20	40	50
Starting Torque, g-cm.	8,000	19,000	22,000
Running Torque, g-cm.	1,000	1,000	2,000
Maximum Temperature, °F.	190	197	197
Running Temperature, °F.	182	190	193
Grease Remaining on Bearing, Grams	7.0	7.0	6.20
Grease Remaining on Bearing, %	35	18	13
Grease in Housing, %	65	82	83
Grease Leakage, %	None	None	4

TABLE VII

EFFECT OF SPEED
(MANUAL CONTROLS)

Bearing Manufacturer	"B"
Bearing No.	211
Temperature of Chamber, °F.	80
Quantity of Charge, Grams	32

RPM	900	1,750
Starting Torque, g-cm.	16,000	16,000
Running Torque, g-cm.	2,000	2,000
Maximum Temperature, °F.	134	173
Running Temperature, °F.	134	173
Grease on Bearing, %	38	32
Grease on Housing, %	62	68
Grease Leakage, %	None	None

TABLE VIII

EFFECT OF CONSISTENCY OF THE GREASE
(MANUAL CONTROLS)

Bearing Manufacturer	"A"
Bearing No.	211
Speed, RPM	1750
Temperature of Chamber, °F.	80
Quantity of Charge, Grams	32

A. S. T. M. Penetration (Unworked)	250	192
Starting Torque, g-cm.	9,000	10,000
Running Torque, g-cm.	1,000	1,000
Maximum Temperature, °F.	116	132
Running Temperature, °F.	116	132
Grease on Bearing, %	63	51
Grease on Housing, %	37	49
Grease Leakage, %	None	None

(Continued to page 25)

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Inland Steel Container Names Rice Manager of New Orleans Plant

The appointment of Norman D. Rice as Branch Manager of the Inland Steel Container Company New Orleans Plant has been announced by John T. Gossett, Vice President and General Manager of the company.

Mr. Rice became a plant apprentice at the Inland Steel Company in 1939 and was transferred to the Inland Steel Container Company in 1940 where he worked on the designing of new equipment and arrangement of plant facilities. He served as a naval officer during the war and upon his return to the company in 1946 he pioneered the design and development of a new product, the Comforteer Gas Heater. In 1947 he became Sales Manager of the Comforteer heater division of the Container Company.

In his new assignment Mr. Rice will be in charge of all operations of the New Orleans plant. Main offices and plant are in Chicago and

NORMAN D. RICE

the company also operates a plant in Jersey City, New Jersey. The Inland Steel Container Company is one of the country's largest manufacturers of steel drums and pails of all sizes and types.

Mail Courses Offered In Lubricants and Fuels

The Petroleum Educational Institute of Los Angeles, offers a group of extension courses for sales personnel of the oil industry. The purpose of these courses is to impart to sales personnel a wide, intelligent, conversational knowledge of lubricants and fuels, and the required understanding of their service value.

Primarily the material includes two courses, a 25-lesson course for general salesmen of automotive and industrial lubricants and fuels and a 15-lesson course for service station salesmen. By using sections of the books, specialized courses are offered in Automotive Lubricants, Automotive Fuels, and Automobile and Industrial Lubricants.

Although the courses treat all phases of the oil industry, they major in sales and service, keeping always in mind their objective of educating the salesman so that he may increase his sales. The courses are well planned, the text material

(Continued to page 30)

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Testing Machine for Grease

(Continued from page 23)

table in the run with 50 grams of grease. As regards the lower running torque obtained with 40 grams charged in comparison with the 20 grams, it should be mentioned that at these low values of torque the results are probably within the experimental error.

Table VII shows the effect of speed on the running characteristics. It is seen that increased speed causes a considerable increase in temperature with somewhat less grease remaining on the bearing.

were so low as to be within the limits of checking of results. However there was a considerable difference in running temperatures as is shown in Table IX.

In Table X are shown evaluations on ball bearings in comparison with roller bearings, and there is also included a comparison of a milled grease vs. an unmilled grease. With regard to the latter, it has generally been supposed that if a grease be milled prior to use, its ultimate worked consistency will have been reached and therefore there will be no further working down in the bearing and consequently no leakage, it being assumed that leakage and

TABLE IX
STOCK BEARINGS
(MANUAL CONTROLS)

Bearing No.	211
Speed, RPM	1750
Temperature of Chamber, °F.	80
Quantity of Charge, Grams	32

Manufacturer	——"A"——		——"B"——		——"C"——	
Bearing	1	2	1	2	1	2
Starting Torque, g-cm	9,000	9,000	9,000	8,000	9,000	11,000
Running Torque, g-cm	1,000	1,000	1,000	1,000	1,000	2,000
Maximum Temp., °F.	131	138	160	159	160	165
Running Temp., °F.	131	138	160	159	160	165
Grease on Bearing, %	49	43	51	41	49	48
Grease on Housing, %	51	57	49	59	51	52
Grease Leakage, %	None	None	None	None	None	None

To show the effect of the consistency of the grease, results shown in Table VIII were obtained. It is seen that with the softer product no leakage occurred, temperatures were lower, and, contrary to expectations, more grease remained on the bearing.

In using this machine to determine the general properties of ball and roller bearing greases, it was realized that such a machine could be used not only to evaluate the greases but also to evaluate different ball and roller bearings now on the market. In line with this idea, stock bearings were purchased from several of the leading manufacturers of ball bearings, and using the same grease as a standard, evaluations were carried out to determine the differences in running characteristics of the bearings. Results are shown in Table IX. In this table the notation "Bearing 1 and 2", represent two different bearings obtained from the same manufacturer. There was found to be very little difference in the starting torques and although there were some differences in the running torques, the values in general working down characteristics go hand in hand. Table X shows that, although a grease may show a definite working down to a softer consistency by the official ASTM Worked Penetration, it may actually become harder after use in a ball or roller bearing. Table X also shows that, in several of the runs for the unmilled grease, the miniature penetration of the used grease remaining on the bearing is harder than the unused grease.

In the case of the milled grease it might be supposed since there is very little difference between the ASTM worked penetration and unworked penetration, very little further working will occur in the bearing and therefore very little leakage will occur. However, the results of the evaluations show about the same amount of leakage for the milled grease as for the unmilled grease in the case of the roller bearing, and in the case of the ball bearing there is even slightly more leakage for the milled product. This leakage occurs in spite of the fact that the grease on the bearing proper actually became considerably harder than the original grease as charged.

(Tables continued page 26)
(Article continued page 27)

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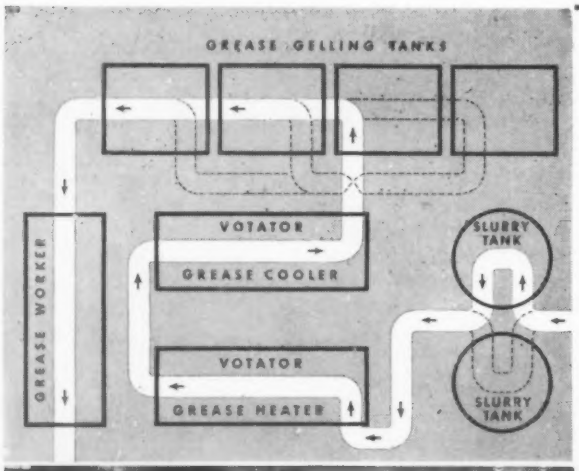
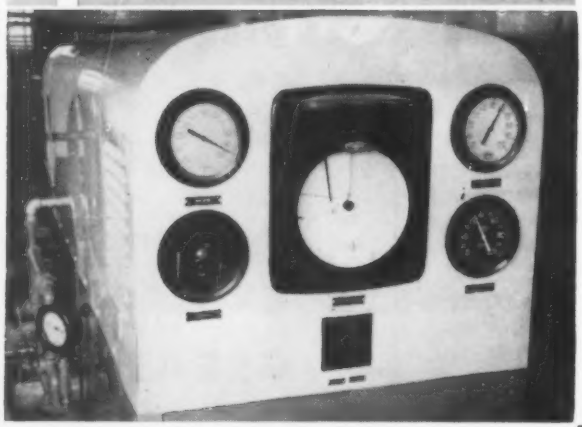
TABLE X

COMPARISON OF MILLED VS. UNMILLED GREASE ON BALL AND ROLLER BEARINGS
(MANUAL CONTROLS)

Identification	Unmilled				Milled			
Penetration:	ASTM		Miniature		ASTM		Miniature	
Unworked	195		54		309		128	
Worked	299		140		328		196	
Speed, RPM	900	900	1750	1750	900	900	1750	1750
Type Bearing Used	Roller Bearing		Ball Bearing		Roller Bearing		Ball Bearing	
Amount of Charge, Grams	50	50	32	32	50	50	32	32
Temperature, °F.	80	80	80	80	80	80	80	80
Starting Torque, g-cm.	97,000	86,000	18,000	16,000	67,000	66,000	18,000	18,000
Running Torque, g-cm.	4,000	3,000	1,000	1,000	4,000	5,000	1,000	1,000
Maximum Temperature, °F.	161	168	154	156	170	170	155	153
Running Temperature, °F.	157	156	117	110	166	170	110	114
Grease on Bearing, %	58	56	13	13	58	57	11	11
Grease on Closed Side, %	11	11	25	25	10.0	11	21	23
Grease on Open Side, %	3	3	45	43	5	4	43	43
Grease Leakage, %	28	30	17	19	27	28	24	23
Miniature Penetration:								
Original Grease	54	54	54	54	128	128	128	128
Used Grease:—								
on Bearing	49	55	45	41	79	118	62	50
on Housing (Closed Side)	67	83	48	51	96	127	52	53
on Housing (Open Side)	57	61	50	52	74	78	48	54
Leakage	81	78	100	98	115	112	93	91

(Continued to page 27)





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(Continued from page 26)

In Table XI are shown results of two greases having practically the same unworked penetration but considerably different worked penetrations; and yet the grease with the greater working down tendency shows no leakage whereas the product showing little or no working down gives considerable leakage.

greases in the same classifications as it did with manual controls.

V. SUMMARY

The development of a testing apparatus for the evaluation of ball and roller bearing greases is described; the apparatus yielding reasonable reproducibility and measuring the important characteristics of torque, temperature and leakage tendency.

The exploratory data presented show that the tendency of a grease to become softer on working down bears no relationship to leakage tendency. The assumption that milling a grease imparts to it the final worked consistency to be expected after use in anti-friction bearings and that it therefore gives superior performance to an unmilled grease, is not borne out.

TABLE XI

WORKED PENETRATION VS. LEAKAGE
(MANUAL CONTROLS)

Bearing Manufacturer	"A"
Bearing No.	211
Speed, RPM	1750
Temperature of Chamber, °F.	80
Quantity of Charge, Grams	32

Grease	A		B		C	
Penetration	ASTM	Miniature	ASTM	Minature	ASTM	Miniature
Unworked	250	47	250	55	276	63
Worked	275	55	429	266	286	87
Starting Torque, g-cm	16,000		10,000		7,000	
Running Torque, g-cm	1,000		1,000		2,250	
Maximum Temperature, °F	118		132		132	
Running Temperature, °F	118		132		124	
Grease on Bearing, %	13		49		34	
Grease on Housing, %	48		51		66	
Grease Leakage, %	39		None		None	
Miniature Penetration:						
Original Grease	47		55		63	
Grease on Bearing	Insufficient grease left on bearing.		Too Soft (490+)		135	
Grease on Housing:						
(Closed Side)	73		Too Soft (490+)		103	
(Open Side)	58		Too Soft (490+)		135	
Grease Leakage	71		None		None	

IV. TEST PROCEDURE AND DATA WITH AUTOMATIC CONTROLS

a. Test Procedure

Automatic controls and recorders are now used to carry out the test procedures described previously. It is necessary for the operator only to set controls at start of test, and then he may leave the apparatus until test is completed, the controls and recorders doing the work. In addition to the uniformity of test procedure gained by the use of these instruments, the automatic recorders result in continuous readings and accurate determination of starting torque.

b. Data Obtained With Automatic Results

As the equipment is now being used for routine tests, the data presented in Table XII serves only to illustrate that the apparatus with automatic controls continues to rate

VI. ACKNOWLEDGMENTS

The writers wish to acknowledge the assistance of C. E. Cummings and Bruce Hegeman in the design of the equipment and O. P. Puryear and W. J. Finn in the performance of the exploratory experimentation. Also S. W. Rose for the installation of the automatic controls and recorders, and F. H. Herdt for the performance of routine testing with the apparatus.

(Table XII on page 30)

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TABLE XII
CALIBRATION RESULTS FOR TORQUE-BREAKDOWN MACHINE NO. 1
Test Period of 3 Hours, 80-250°F. Temperature Rise in 1 Hour, 2 Hours at 250°F.
BALL AND ROLLER BEARING GREASE

	Manual Control				Automatic Control			
Bearing	Tapered Roller		211 Ball		Tapered Roller		211 Ball	
Speed, RPM	900	900	1750	1750	900	900	1750	1750
Starting Torque	25,800	21,000	5,200	4,600	18,240	17,480	4,028	3,800
Running Torque	2,500	2,200	1,400	1,500	1,900	2,280	1,140	1,140
Maximum Temp., °F	267	262	262	262	260	261	261	260
Running Temp., °F	262	259	260	260	258	261	259	257
Grease on Bearing, %	34	34	6	9	34	34	6	6
Grease in Housing, %	16	20	66	63	22	22	59	59
Grease Leakage, %	50	46	28	28	44	44	35	35
Miniature Penetrations								
Original Grease	54	54	54	54	54	54	54	54
Grease From Bearing	32	32	Ins. Sample	Ins. Sample	36	38	Ins. Sample	Ins. Sample
Remarks								
Color	Darker	Darker			Darker	Darker		
Distribution	Fair	Fair	*	*	Poor	Poor	Fair	Fair
Oil Separation	None	None	*	*	Normal	Normal	Normal	Normal
Condition of Grease on Bearing	Greasy	Greasy	*	*	Dry	Dry	Greasy	Greasy
Condition of Bearing After Test	Satis-factory	Satis-factory	*	*	Satis-factory	Satis-factory	Satis-factory	Satis-factory
Overall Rating	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor

*Not enough grease on bearing to evaluate.

WHEEL BEARING GREASE

	Manual Control				Automatic Control			
Bearing	Tapered Roller		211 Ball		Tapered Roller		211 Ball	
Speed, RPM	900	900	1750	1750	900	900	1750	1750
Starting Torque, g-cm.	68,450	57,800	19,800	15,500	42,500	60,000	17,480	17,480
Running Torque, G-cm.	3,100	3,100	1,600	1,500	2,888	3,000	1,140	1,368
Maximum Temp., °F.	270	271	264	264	267	268	264	260
Running Temp., °F.	269	269	263	262	265	268	262	259
Grease on Bearings, %	36	36	18	18	36	44	12	15
Grease in Housing, %	36	32	41	41	32	34	50	41
Grease Leakage, %	28	32	41	41	32	22*	38	41
Miniature Penetrations								
Original Grease	62	62	62	62	62	62	62	62
Grease From Bearing	54	55	Ins. Sample	Ins. Sample	51	48	Ins. Sample	Ins. Sample
Remarks:								
Color	Normal	Normal	Same	Same	Same	Same	Same	Same
Distribution	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair
Oil Separation	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Condition of Grease on Bearing	Greasy	Greasy	Greasy	Greasy	Greasy	Greasy	Greasy	Greasy
Condition of Bearing After Test	Satis-factory	Satis-factory	Satis-factory	Satis-factory	Satis-factory	Satis-factory	Satis-factory	Satis-factory
Overall Rating	Fair	Fair	Poor	Poor	Fair	Fair	Poor	Poor

*This lower leakage value is not believed to be caused by the operation of the automatic control, but by the erratic leakage characteristics of this type of grease under fully packed housing conditions.

Mail Courses in Lubricants and Fuels

(Continued from page 24)

is simple and non-technical. They are illustrated with hundreds of drawings, sketches, and homely illustrations which make clear and understandable the technical subjects sales and service men should know. In a thorough and practical manner they present the application of lubricants and fuels so that sales and service men can understand and apply the information.

Upon successful completion of the course, the student receives a "certificate of graduation." A number of oil companies have approved the course for their sales personnel. In many cases, they pay the tuition for men they select to take the course, and in others they reimburse the students for the tuition after completion of the work.

Also of help to the service station owners is the Consumers Gasoline Guide because it answers the questions commonly asked by the motorists, including how to save gasoline. It is of interest to service managers of fleet and commercial accounts and to those in maintenance shops and new car dealerships.

Future A.S.T.M. Meetings

Technical Men, Engineers and Those Concerned With Materials Invited to Attend A.S.T.M. Meetings

The following is a list of future A.S.T.M. National, District and Technical Committee meetings. These meetings will be of particular interest to many "Spokesman" readers.

A.S.T.M. NATIONAL MEETINGS

1949 (FIFTY-SECOND) ANNUAL MEETING, Chalfonte-Haddon Hall, Atlantic City, N. J., June 27 to July 1, inclusive.

1949 SPRING MEETING AND A. S. T. M. COMMITTEE WEEK, Hotel Edgewater Beach, Chicago, Ill., February 28 to March 4, inclusive.

1949 WEST COAST MEETING, (first national meeting of A.S.T.M. on the West Coast), Fairmont Hotel, San Francisco, Calif., October 10 to 14, inclusive.

A.S.T.M. DISTRICT MEETINGS

NEW YORK DISTRICT, Engineering Societies Building, December. Subject to be announced.

PHILADELPHIA DISTRICT, Franklin Institute, January 13. Subject, "Research," by Dr. Clyde E. Williams, Battelle Memorial Institute.

NEW YORK DISTRICT, Engineering Societies Building, February 3. Subject to be announced.

PHILADELPHIA DISTRICT, McCallister's, 1811 Spring Garden St., February 10. Subject: "Industrial and Materials Quality Control." Afternoon and Evening Sessions. Several speakers including film on Quality Control, by Simon Collier, Director of Quality, Johns Manville Corp.

PHILADELPHIA DISTRICT, Franklin Institute, March 22. Subject: "Industrial Stream Pollution—The Problem—The Cure."

A.S.T.M. TECHNICAL COMMITTEE MEETING

COMMITTEE A-1 ON STEEL, January 24-26, 1949, Pittsburgh, Pa.

These meetings are usually technical sessions sponsored by the A.S.T.M. district in the area indicated. Ordinarily District Meeting speakers are not prepared to furnish manuscripts, although in some cases they are available.

Stewart-Warner Nets $2,609,725

Net earnings of $2,609,725, or $2.02 per share of capital stock, for the first nine months of 1948, were reported today by Stewart-Warner Corporation. The statement was unaudited and subject to year-end adjustments. In 1947 net earnings were $1,938,851 or $1.49 a share for the first three quarters.

Sales for the first nine months of 1948 were $55,993,599, down 1.6% when compared to sales of $56,926,546 for the same period of last year. Sales for the third quarter of 1948 were $18,124,114, up 8.2% over 1947 third quarter sales of $16,748,250.

Commenting on third quarter sales, which were 11.7% under those of the previous quarter of 1948, James S. Knowlson, president and board chairman of Stewart-Warner said that the annual vacation period of two weeks in all plants of the company had cut shipments during the period. The lowered earnings in the third quarter, as compared with the first two quarters in 1948, reflected both lower shipments and third round wage increases, which became effective in the third quarter, he said.

As was the case in 1947, third quarter earnings in 1948 declined as compared to earnings in the first two quarters of the year. Earnings for first, second and third quarters in 1948 were 70 cents, 75 cents and 57 cents, while in 1947 they were 57 cents, 48 cents and 44 cents.

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Annual Meeting

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In demonstrating the value of these tests he pointed out that they eliminate the materials of obvious shortcomings, insure the uniformity from batch to batch and make it possible to get field comparisons of similar lubricants.

Automatic Transmissions

H. R. Wolf, Assistant to the Technical Director of General Motors Research Laboratories, told the lubricant manufacturers that the new automatic transmissions, fluid couplings and torque converters on passenger cars would have to be standardized by car manufacturers before the lube industry would be asked to distribute the fluids for lubricating them. Today transmission fluids are designed specifically for each model transmission job just as gears, pistons, and other integral parts are designed for a particular make or model automobile.

Many different models of these transmissions are being made by various car manufacturers. No standardization exists either in the unit or in the fluid used in the transmission.

"Obviously," he pointed out, "petroleum refiners and marketers cannot be expected to supply to their filling stations and retail outfits different types and viscosity grades of fluids for use in each of the different models and types of automatic transmission. This would result in no end of confusion and a general misapplication of these special fluids," Mr. Wolf declared. When and if standardization is possible, it was the speaker's belief that it would be desirable to merchandise fluid through regular petroleum channels with methods for approving and identifying fluids that meet the manufacturer's requirements. Such standardization, to win the support of the auto manufacturers, also must "insure that improper or inferior fluids will not be offered by marketers or jobbers who are not fully appreciative of the exacting requirements."

Lubricating Farm Machinery

Lewis S. Plett, Minneapolis Moline Power Implement Company, told the group that education of the farmers in caring for his tractor has resulted in the correction, to a great extent, of the old slogan, "Pump enough grease so that it appears at the ends of the bearings." Many cylinder shaft bearing seals have been ruined through use of this old-time theory, he emphasized.

The speaker gave much credit to the lubricating grease manufacturers in developing farm machinery lubrication into a scientific art as exists in the automotive machinery field. He attributed this progress to the fact that the lubricating grease manufacturer has not been afraid or ashamed to look in his service manual.

Although the number of grease fittings on the modern farm tractor have been remarkably reduced, the present day harvester, corn picker and self-propelled combines still bristle with grease fittings, he commented. An example is given in the

(Continued to page 33)

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Dr. Ogburn Will Head Research and Development Of Foote Mineral Co.

Appointed Manager of Research and Development and Chairman of the Research and Development Committee for Foote Mineral Company of Philadelphia, Doctor S. C. Ogburn, Jr. is now in direct charge of all such activity.

In line with Foote's long-time progress program, Dr. Ogburn was selected for this post because of his demonstrated ability in both research and administration.

After receiving his Bachelor of Science degree from the University of North Carolina in 1921, his Master's from Washington and Lee in 1923 and his Doctorate from North Carolina in 1926, Dr. Ogburn joined the faculty of Bucknell University as Professor of Chemical Engineering. He served as head of this department from 1928 to 1936 leaving to become first Project Engineer, then Technical Supervisor and finally Research Manager for the General Chemical Company, New York. In this last capacity Dr. Ogburn was administrative supervisor of the entire research division as well as director of all projects at the company's laboratory.

In 1943 Dr. Ogburn became associated with the Pennsylvania Salt Manufacturing Company in Philadelphia as Research and Development Manager. From 1943 to the present he was materially responsible for a considerable growth and improvement in both organization and research facilities for that company, including the Whitemarsh Research Laboratories.

Dr. Ogburn is a member of the American Chemical Society, The American Society of Engineering Education, The American Institute of Chemical Engineers, the Chemical Society of London, Charter Member of the Virginia Academy of Science, as well as XI, Alpha Chi Sigma and Pi Mu Epsilon. He is also secretary of the Research Management Group of Philadelphia.

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case of the corn picker which has one hundred such fittings that should be greased twice a day whenever it is in operation.

Proper Lubricants for Farm Machinery

Following Mr. Plett's talk Mr. M. D. Gjerde, Standard Oil Company, (Indiana) took up the subject of proper lubricants for farm machinery.

He declared that while improvements are continually being made in the quality of greases, those now available are very satisfactory for farm machinery lubrication. Explaining the reasons for unsatisfactory lubrication, he attributed this as being usually due to the lack of application because of neglecting servicing at proper intervals, use of the wrong type of grease, or contamination of the lubricating grease in storage and handling. Mr. Gjerde commented on the rapid farm mechanization that has progressed with tractor population at 3,114,000 in mid-1948, with an accompanying increase in implements and attachments. Early 1948 saw the advent of 4,928,000 cars and 2,191,000 trucks in use on farms, representing about sixteen percent and thiry-three percent, respectively, of total registrations. He declared that most of the cars and trucks received complete lubrication at service stations in town rather than on the farm.

Defense Lube Requirements

Col. L. E. Cotulla, Executive Officer, Armed Service Petroleum Purchasing Agency, declared that in the past fiscal year, ending June 30th, 1948, the military procured about 50,000,000 gallons of lube oils and about 10,000,000 pounds of greases and estimated requirements for the current fiscal year indicated a need for about 65,000,000 gallons of lube oils and 11,000,000 pounds of grease.

These are procurement figures for planning purposes and they do not necessarily represent actual operating needs. Nominal reserves for the emergency period represent several years' supply at present rates.

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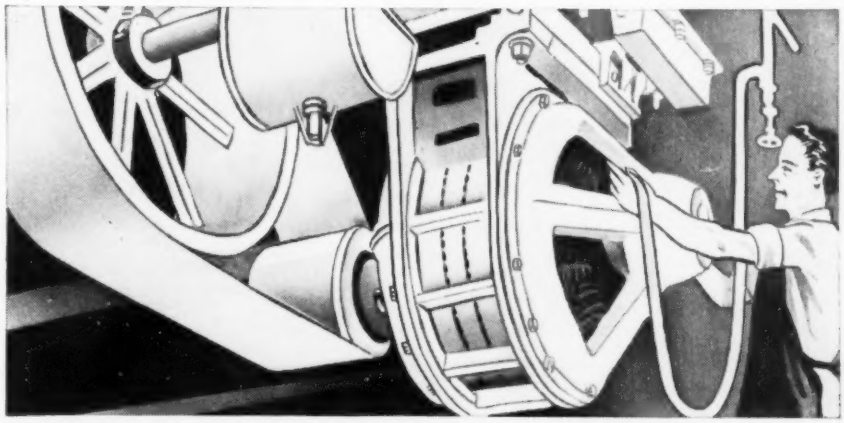

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Annual Meeting

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Col. Cotulla said, and correct procurement of greases is largely to meet Army and Air Force requirements which represent about the same percentage as their peak wartime needs of 60,000,000 pounds yearly as the Navy consumption figures. Allocating the use of the 65,000,000 gallons requirements of lube oil for this year, the speaker estimated about forty percent will be aircraft engine oils, another forty percent motor oils and the remainder made up of special lubricants such as machine oil, cylinder oil, red engine oil and the like. Non-lubricating oils such as cutting oils, preservative oils, and hydraulic oils add almost a million gallons to the above requirements. The bulk of the grease requirements for the coming year will be composed of general purpose greases for automotive equipment. He expected that about ninety percent of the military procurements in greases for the fiscal year will be in these types. The remainder will be made up largely of special products such as chain and wire rope lubricants, plus valve grease. Extensive research is being carried out by the military on lubricants and substantial progress has been made in the development of low temperature lubes, he said in discussing future product needs.

Other Papers Delivered

During the two-day general sessions a total of twelve technical papers were delivered by sixteen authors.

A few of the highlights have been reviewed in these columns. It would be impossible to say which was the most interesting paper or to select a group for review. All were outstanding in the method presented and all showed the result of much work and care in their preparation. All papers delivered during the course of the general sessions will appear in future issues of "The Institute Spokesman," along with illustrations used in their presentation.

Demand for preprints has exceeded all expectations due to the unusually large attendance at the meeting. The Institute office does have a few preprints remaining which are available without cost.

Technical Committee Meeting

The third day of the meeting, October the 13th, was entirely devoted to a meeting of the Technical Committee headed by Mr. T. G. Roehner. Well attended and intensely interesting, the meeting was considered of such value that complete stenographic notes were made of the entire proceedings. A review of the Technical Committee meeting will be given in a future issue of "The Institute Spokesman".

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